IceCube System Architecture and Software Design Description

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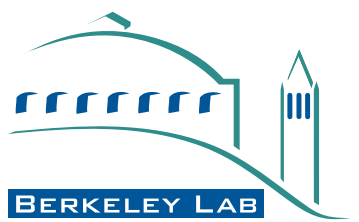


Purpose of this Presentation

- **State the Scope of the IceCube "Production" software system.**
- **Give an overview of the IceCube software system.**
  - Introduce the concept of a 'Software Design Description.'
- **Show the context of the DAQ sub-system within the overall IceCube software system.**

Purpose of "production" IceCube software system

"To provide the physicist, in collaboration with the DAQ hardware, with stable, reliable, reproducible access to data taken by the IceCube detector and data created by any approved simulation of the detector, so that they can publish physics papers."

Scope of "production" IceCube software system (I)

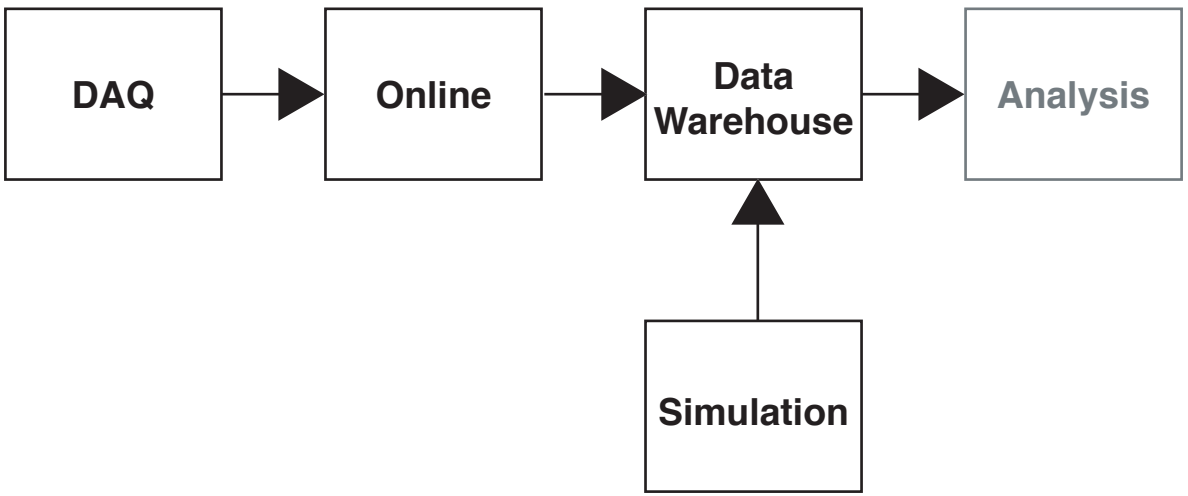
- **Includes software which does the following:**
  - operate the IceCube detector;
  - read data from the detector and record and archive data which is deemed to be important for generating physics results;
  - transfer of this recorded data from the South Pole to the "Northern Hemisphere";
  - store, catalog and process with approved algorithms, this data in a Data Warehouse;
  - provide, upon request from a physicists, data for analysis in suitable data formats

Scope of "production" IceCube software system (II)

- **It also covers a similar chain of software for "any approved simulation of the detector"**
- **The following are explicitly excluded:**
  - analysis specific processing of the data;
  - generation of private simulations of the data;
  - preparation of physics papers for publication.

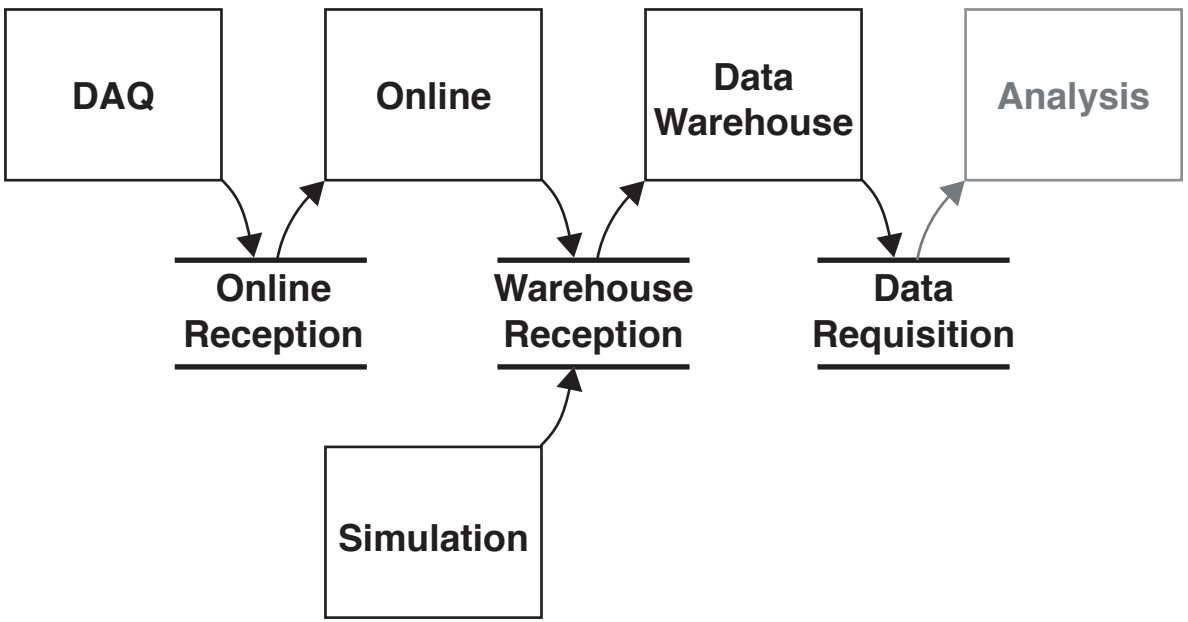
(Though these may make use of portions of the "production" system.)

Main Dataflow for the system



- Implies “pipeline” architecture would be good choice for the system.

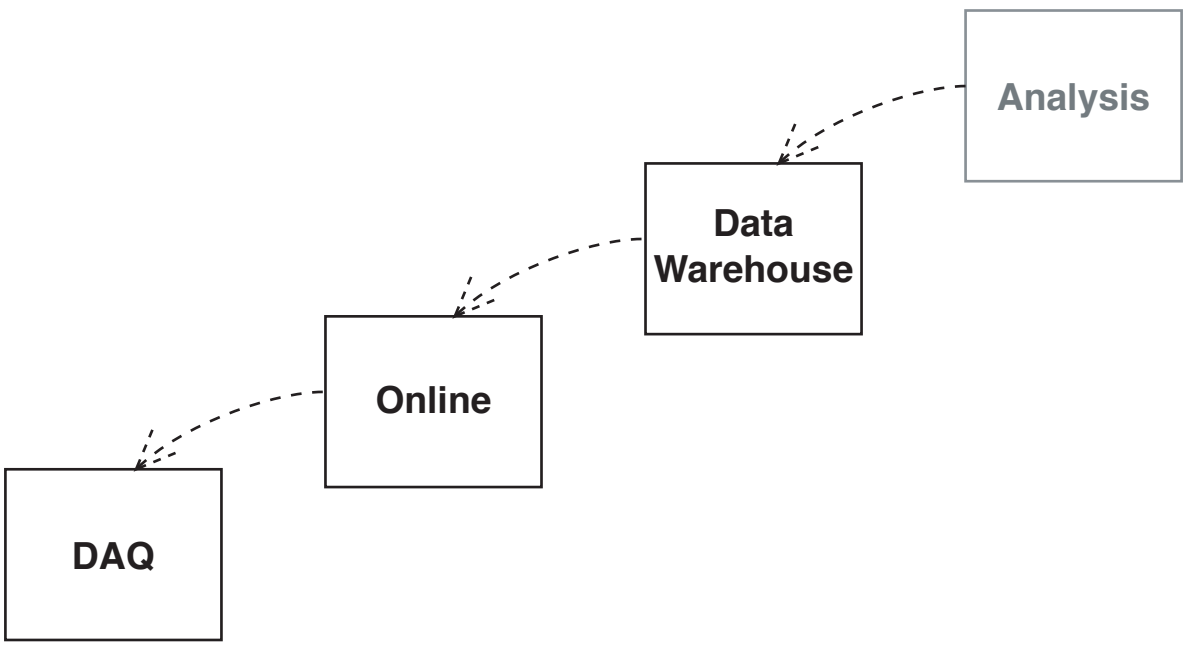
“Pipeline” view of the system



- “Data stores”, Online Reception, etc.,are a result of dependency inversion.

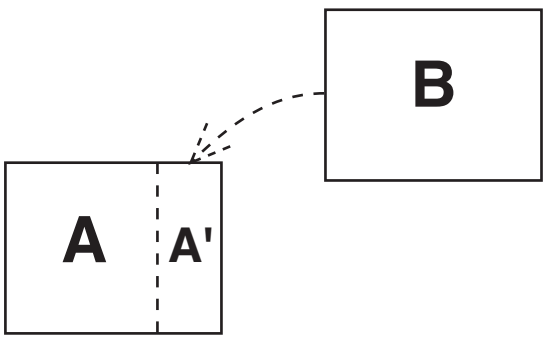
Dependency Inversion (I)

- Avoids deep & overly broad dependencies.



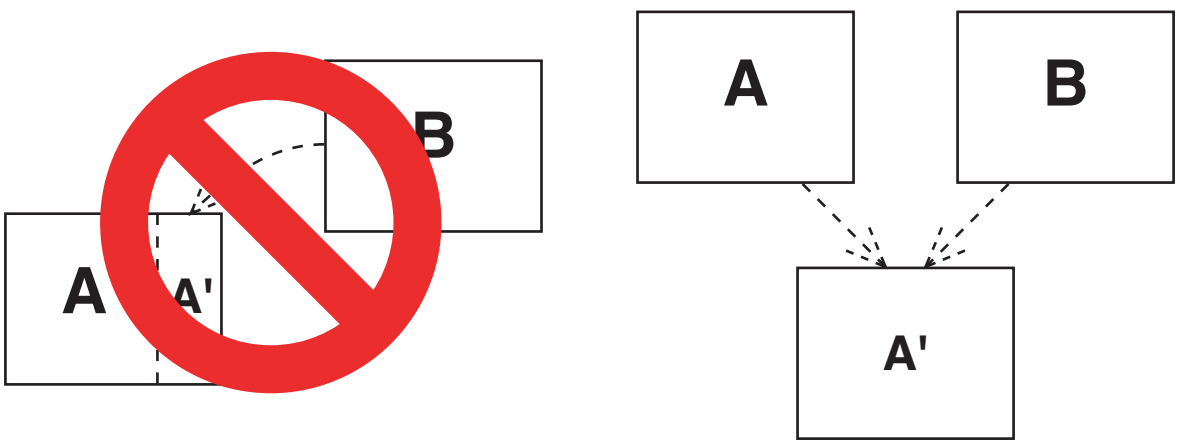
Dependency inversion (II)

- Often caused by poor partitioning.

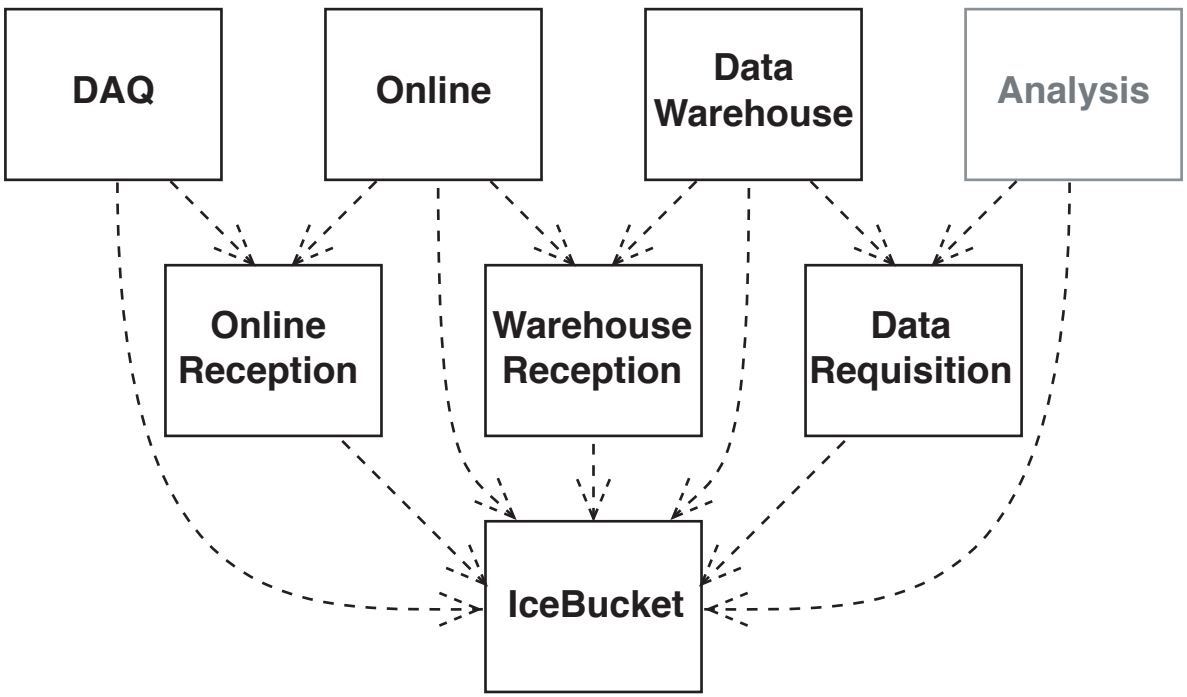


Dependency Inversion (III)

- Solution is to break out “Dependant” code.



Dependency View of the System



(The "IceBucket" entity contains components used by all (or at least most) of the entire system, e.g. logging, etc.)

Software Design Description (I)

- **Definition from IEEE Std 610.12-1990 "Standard Glossary of Software Engineering Terminology"**

  A representation of software created to facilitate analysis, planning, implementation, and decision making. The software design description is used as a medium for communicating software design information, and may be thought of as a blueprint or model of the system.

Software Design Description (II)

- **Main Sections:**
  - Based on IEEE Std 1016-1998 “Recommended Practice for Software Design Descriptions”
  - Can contain text and diagrams
  - Introduction
  - Background
  - Decomposition View
  - Dependency View
  - Interface View

Decomposition View of the System (I)

- **ID: Production Software**
- **Type: System**
- **Purpose:**

  To provide the physicist, in collaboration with the DAQ hardware, with stable, reliable, reproducible access to data taken by the IceCube detector and data created by any approved simulation of the detector, so that they can publish physics papers.

Decomposition View of the System (II)

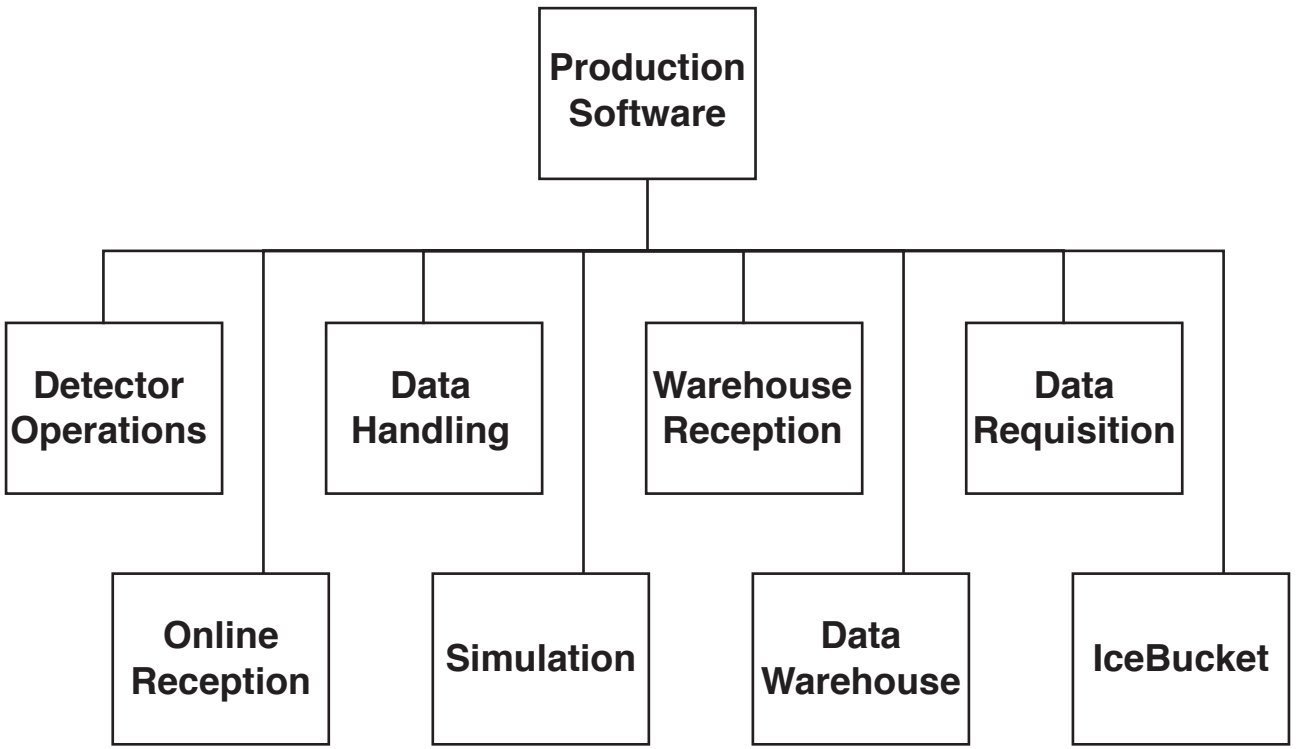
- **Function:**
  - Control and monitoring of the detector at the South Pole.
  - Acquisition of all data from the detector hardware necessary to generate useful physics data, this can include, but is not limited to, raw data from the DOMs, filtered data from the DOMs, any calibration data, and local environmental data.
  - Archiving of all recorded data at the South Pole and managing the data's transfer to the Northern Hemisphere Data Warehouse.
  - Management of the Northern Hemisphere Data Warehouse.

Decomposition View of the System (III)

- **Function (cont):**
  - Creation of simulated data sets for engineering and physics studies and their transfer to the Northern Hemisphere Data Warehouse.
  - Providing the physicists with a set of data files from the Data Warehouse, that are a response to a specific query.

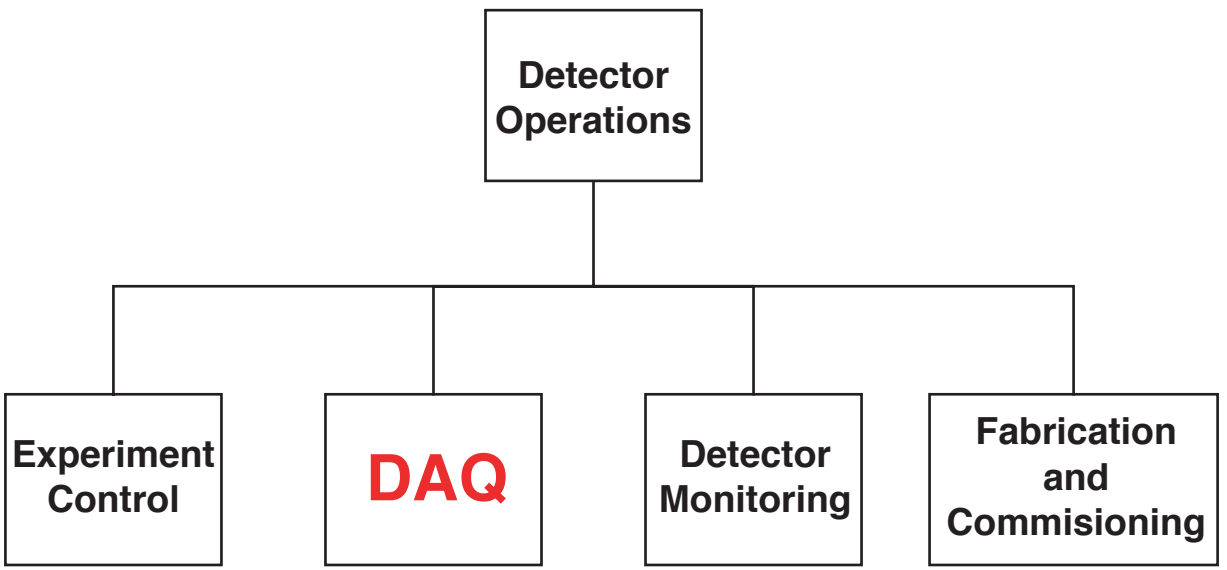
Decomposition View of the System (III)

- **Subordinates:**



DAQ Context with the System

- A Subordinate of the 'Detector Operations' sub-system.



- Chuck with present SDD for DAQ.

Summary

- **Stated the Scope of the IceCube "Production" software system.**
- **Gave an overview of the IceCube software system.**
  - Introduces the concept of a "Software Design Description."
- **Showed the context of the DAQ sub-system within the overall IceCube software system.**